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could be a large increment of heat as we approach the center. To sum up the whole matter, his objections to the segregation of *miscible* liquids are qualitatively correct, but the quantitative accuracy is impaired by the nature of the assumptions on which the estimate is based. These assumptions are thought to be incorrect in some instances, and in all cases to lack the positive proof necessary for a scientific demonstration.

It seems unnecessary to assume that when *immiscible* liquids are formed segregation can only take place along the walls, and therefore involve extended molecular flow.

Instead of this we conceive that the process may resemble crystallization and take place at many centers, and therefore involves molecular flow through short distances. All stirring, currents, etc., instead of hindering, would aid in this case.

Finally, we have the fact of a regular rock gradation established; a gradation which is too widespread and uniform to be explained by an original heterogeneity of earth, and a chance mixing of the lavas. Our present knowledge, and the data at hand, are probably too meager to exactly explain the processes by which such gradation was accomplished. Yet, we may not affirm, with Dr. Becker, that rock differentiation is impossible under the known laws of physico-chemistry.

The problem will doubtless yield when attacked by the methods of modern physics and chemistry, and for this reason Dr. Becker's paper is most timely.

CYRUS FISHER TOLMAN, JR.

An Introduction to Geology. By W. B. SCOTT. The Macmillan Company. 1897. 573 pp. \$1.90.

The preparation of a satisfactory text-book on any subject so large as geology must always be a difficult matter. There is so much difference of opinion as to where emphasis should be laid, as to what should be said and what omitted, and as to the order in which the topics should be treated, that no book is likely to command universal approval in all respects. Yet in spite of all the difficulties Professor Scott has succeeded in preparing a book which will command respect and probably very general approval. He has shown in its preparation a sense of proportion which the makers of text-books sometimes fail to exhibit. When to this is added that he has made use of the newer literature throughout, so that the book is up to date, it will readily be inferred

that the book is likely to prove a useful one in institutions where brief courses in geology are taken by somewhat mature students.

The book perhaps departs as much and as satisfactorily from the text-books heretofore in use, in its treatment of the later parts of historical geology, as at any point. In his treatment of the Mesozoic and later periods, the author has brought together much data not heretofore incorporated in a text-book, and his handling of that difficult part of the subject is much more satisfactory than that found in most text-books of corresponding scope.

The illustrations in the volume are mainly new and attractive, many of them being reproductions from photographs direct. The illustrations of fossils seem to have been selected with great care, but are, on the whole, fewer in number than could have been wished.

The publishers have done their usual excellent work in the preparation of the volume.

R. D. S.

Missouri Geological Survey, Vol. XI; Clay Deposits. By H. A. WHEELER. 622 pp., 39 pl. Jefferson City, 1896.

The eleventh volume issued by the Missouri Survey is well up to the standard of the previous work. It is a report of much more than local interest, and will doubtless become the standard book of reference for clay workers, filling a position analagous to that of the Manganese Report of the Arkansas Survey. The Missouri clay report is the most comprehensive work treating this subject issued by any American state since the New Jersey report of 1878. It monographs the subject of clays and clay working as exemplified in the wide range of deposits and processes in Missouri. It is written from the point of view of the engineer and treats of the different clays as adapted to various uses. Nevertheless there are many geological problems whose solution will be the easier for it. The large number of new analyses, as well as the careful tabulation of a wide range of older ones is alone a feature of great value. The physical tests, the studies of fusibility, plasticity, and shrinkage, aside from their immediate practical importance, may be used to advantage in studies of the origin of mountains and of mountain-making forces. Probably few portions of geology are less understood or more complex than that which relates to metamorphism, and in order to understand the nature of metamorphic rocks it is necessary to have something more than a general notion of the nature of the